

COSMETIC COMPOSITION CONTAINING MINERAL PARTICLES AND A
POLYETHYLENEIMINE

Reference to Prior Applications

5 This application claims priority to U.S.
provisional application 60/432,623 filed December 12,
2002, and to French patent application 0215175 filed
December 2, 2002, both incorporated herein by
reference.

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Field of the Invention

 The present invention relates to a
composition, especially a hair composition, comprising,
in a cosmetically acceptable medium, mineral particles
15 and at least one polyalkyleneimine. The invention is
also directed towards a cosmetic hair treatment process
comprising the application of this composition and also
its use, especially as a rinse-out hair product.

 Additional advantages and other features of
20 the present invention will be set forth in part in the
description that follows and in part will become
apparent to those having ordinary skill in the art upon
examination of the following or may be learned from the
practice of the present invention. The advantages of
25 the present invention may be realized and obtained as
particularly pointed out in the appended claims. As
will be realized, the present invention is capable of

other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the present invention. The description is to be regarded as
5 illustrative in nature, and not as restrictive.

Background of the Invention

It is common practice to use detergent hair
10 compositions (or shampoos), based essentially on standard surfactants in particular of anionic, nonionic and/or amphoteric type, but more particularly of anionic type, to clean and/or wash the hair. These compositions are applied to wet hair and the lather
15 generated by massaging or rubbing with the hands allows, after rinsing with water, the removal of the diverse soiling initially present on the hair.

Admittedly, these base compositions have a good washing power, but their intrinsic cosmetic
20 properties nevertheless remain fairly poor, especially due to the fact that the relatively aggressive nature of such a cleaning treatment can in the long run result in more or less pronounced damage to the hair fiber, associated in particular with the gradual removal of
25 the lipids or proteins contained in or on the surface of the said fiber.

Thus, to improve the cosmetic properties of the above compositions, and more particularly of those intended to be applied to sensitized hair (i.e. hair that is in a damaged or embrittled condition, especially due to the chemical action of atmospheric agents and/or hair treatments such as permanent-waving, dyeing or bleaching operations), it is now common practice to introduce into these compositions additional cosmetic agents known as conditioners, which are mainly intended to repair or limit the harmful or undesirable effects induced by the various treatments or attacking factors to which hair fibers are more or less repeatedly subjected. These conditioners can, of course, also improve the cosmetic behaviour of natural hair.

The conditioners most commonly used to date in shampoos are cationic polymers, silicones and/or silicone derivatives, which give washed, dry or wet hair markedly increased ease of disentangling and softness when compared with that which may be obtained with the corresponding conditioner-free cleansing compositions.

However, these cosmetic advantages are unfortunately also accompanied, on dried hair, by certain cosmetic effects considered undesirable, namely lankness of the hairstyle and a lack of smoothness.

In addition, the use of cationic polymers for this purpose has many drawbacks. On account of their strong affinity for the hair, some of these polymers become deposited in a substantial amount during repeated uses, and lead to undesirable effects such as an unpleasant, laden feel, stiffening of the hair, and adhesion between fibers which affects the styling. These drawbacks are accentuated in the case of fine hair, which lacks liveliness and volume.

It has already been proposed to use particles in rinse-out compositions, so as to improve the feel and appearance of the hair. By way of illustration, patent US 5 334 376 proposes the addition of calcium carbonate particles to hair-conditioning compositions containing a silicone, a fatty alcohol and an amide.

In patent application DE 199 46 784, it has also been proposed to use particles of various oxides, hydroxides, carbonates, silicates or phosphates in hair compositions, to reduce the greasy appearance of the hair. It is generally envisaged to combine these particles with standard shampoo ingredients.

However, despite the progress recently made in the field of rinse-out hair products and especially shampoos, these products do not truly give total satisfaction, and as such there is currently still a strong need to provide novel products that show better

performance qualities in one or more of their properties.

Detailed Description of the Preferred Embodiments

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The inventors have discovered, surprisingly and unexpectedly, that by selecting the conditioner, combined with particular mineral particles, it is possible to improve the results obtained with products, especially cosmetic products like rinse-out hair products, in terms of cosmetic properties and hairsetting properties. In particular, the hair is given texture (greater sensation of thickness) and better hold of the hairstyle.

15 One subject of the invention is a composition, especially a hair composition, comprising, in a cosmetically acceptable medium:

(a) solid mineral particles comprising at least one element from columns IIa, IIIa and IVa of the Periodic Table of the Elements, and

20 (b) at least one polyalkyleneimine, the polyalkyleneimine/mineral particle weight ratio being 0.1 - 0.0001.

For purposes of this invention, the version of the Periodic Table used is the CAS version (Chemical Associated Society). It is included for example in the book "The Merck Index" 11ed. 1989.

Another subject of the present invention is a cosmetic hair treatment process using the composition according to the invention.

A subject of the invention is also the use of
5 the invention composition to give the hair texture (greater sensation of thickness) and better hold of the hairstyle.

A subject of the invention is also the use of the invention composition in hair cosmetics, especially
10 in rinse-out hair application, especially as a shampoo.

Other subjects, characteristics, aspects and advantages of the invention will emerge even more clearly on reading the description and the various examples that follow.

15 (a) MINERAL PARTICLES

The solid mineral particles comprise at least one element from columns IIa, IIIa and IVa of the Periodic Table of the Elements and preferably from columns IIa and IVa. Mixtures may be used. They are
20 especially chosen from particles containing at least 10% by weight of calcium carbonate or of at least one silicate, particles containing at least 90% aluminium oxide, silicas, magnesium oxide and barium sulphate, and mixtures thereof.

25 The solid mineral particles preferably have a number-average primary size of between 2 nm and

2 microns, more preferably between 5 nm and 500 nm and even more preferably between 10 nm and 250 nm.

The particles according to the invention may, for example, have any form, for example the form of
5 spheres, flakes, needles, platelets or totally random forms. They are preferably substantially spherical.

For the purposes of the present invention, the expression "*primary particle size*" means the maximum size that it is possible to measure between two
10 diametrically opposite points on an individual particle. The size may be determined, for example, by transmission electron microscopy or from measuring the specific surface via the BET method, or alternatively by means of a laser granulometer.

15 In accordance with the present invention, the particle may be a bulk particle formed entirely from calcium carbonate. Calcium carbonate may also totally or partially constitute the core of the particle, this core being covered with another constituent, for
20 example an oxide, a silicate or a metal. Calcium carbonate may also exclusively form the coating of a substrate of different chemical constitution, for example an oxide, a silicate or a metal.

In the case where the particles are formed
25 from calcium carbonate and other fillers, the calcium carbonate is in free form and does not form chemical bonds with the other fillers. This is then a case of an

alloy between the calcium carbonate and other fillers, especially with metal oxides or metalloid oxides, obtained in particular by thermal fusion of these various constituents.

5 When the particles containing at least 10% by weight of calcium carbonate also comprise a metal oxide or a metalloid oxide, this oxide is chosen especially from silicon oxide, boron oxide and aluminium oxide, and mixtures thereof.

10 The particles preferably contain at least 50% by weight of calcium carbonate, better still at least 70% by weight, and particles consisting of more than 90% by weight of calcium carbonate are particularly preferred according to the present invention.

15 Even more advantageously, the particles containing at least 10% by weight of calcium carbonate are particles of substantially pure calcium carbonate.

 The calcium carbonate that is suitable for use in the compositions of the present invention may be
20 of natural origin or may be of synthetic origin. In the latter case, it may be obtained from calcium oxide, calcium peroxide, calcium acetate or calcium ethoxide.

 The aluminium oxide particles according to the invention preferably consist essentially of any
25 optionally hydrated alumina, for instance boehmite.

 The silicates that may be used according to the invention include those chosen from sodium

silicate, magnesium silicate and/or lithium silicate. The compounds sold by the company Laporte under the name Laponite XLG and Laponite XLS may especially be used.

5 When the particles containing at least 10% by weight of at least one silicate also comprise a metal oxide or a metalloid oxide, this oxide is preferably chosen from silicon oxide, boron oxide and aluminium oxide, and mixtures thereof.

10 The silicates that are suitable for use in the compositions of the present invention may be of natural origin or of synthetic origin.

 The mineral particles according to the invention are preferably used in an amount of between
15 0.01% and 30% by weight, more preferably between 0.05% and 10% by weight and more particularly between 0.1% and 5% by weight relative to the total weight of the composition.

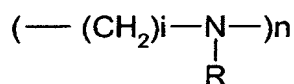
 The composition according to the invention
20 may also contain other types of particles, for example titanium oxide or zinc oxide particles.

(b) POLYALKYLENEIMINE

 The polyalkyleneimines preferably used according to the invention are polymers containing from
25 6 to 20 000 repeating units. Mixtures may be used. Polyalkyleneimines comprising at least 5% of tertiary amines, advantageously at least 10% and even more

preferably at least 20% of tertiary amine functions, are preferably selected. These polymers may be linear or branched homopolymers or copolymers, or homopolymers or copolymers of dendrimer structure.

5 These polymers preferably comprise the following repeating units:

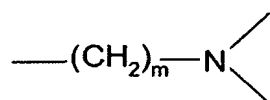


10 in which:

i represents an integer greater than or equal to 2 and preferably less than or equal to 6; preferentially, i=2;

n represents an integer ranging from 6 to 15 20 000 and preferably from 8 to 2 500;

R represents a hydrogen atom or a unit



20 in which m represents an integer greater than or equal to 2; preferentially, m=2.

These polymers are generally terminated with amine end functions and especially primary amines.

According to the invention, the 25 polyalkyleneimines are preferably poly(C2-C4)alkyleneimines and more particularly polyethyleneimines.

The polyalkyleneimines used in accordance with the invention preferably have a weight-average molecular weight ranging from 300 to 100 000, preferably from 350 to 50 000, more particularly from 400 to 10 000 and preferentially from 500 to 2 000.

Polyalkyleneimines having these molecular weights can improve the dispersion of the mineral particles and consequently their deposition.

The molecular weights may be determined by quasi-elastic light scattering.

The polyalkyleneimines preferably have a cationic charge density of less than or equal to 20 meq/g and preferably greater than or equal to 0.05 meq/g, and more particularly from 4 to 20 meq/g.

The charge density may be determined according to the Kjeldahl method or calculated.

The polyalkyleneimines are described especially in the book "Polymer Science Dictionary" 2nd edition, Mark Alger, Chapman & Hall, 1997.

The polyalkyleneimines are preferably present in the compositions according to the invention in proportions ranging from 0.0005% to 5% by weight, preferentially from 0.001% to 1% by weight, more particularly from 0.005% to 0.05% by weight and even more preferentially from 0.005% to 0.25% by weight relative to the total weight of the composition.

The polyalkyleneimine(s) may preferably be used in a weight ratio with the mineral particles ranging from 0.1 to 0.0001 and preferably from 0.05 to 0.001.

5 The compositions of the invention also preferably comprise at least one surfactant, which may be present in, for example, an amount of between 0.2% and 40% by weight approximately, preferably between 1% and 35% and even more preferentially between 1.5% and
10 30%, relative to the total weight of the composition.

The surfactants that are suitable for use in performing the present invention may be of any nature and are preferably soluble in water at room temperature:

15 (i) Anionic surfactant(s):

In the context of the present invention, their nature is not a truly critical feature.

Thus, as examples of anionic surfactants which can be used, alone or as mixtures, in the context
20 of the present invention, mention may be made in particular (non-limiting list) of salts (in particular alkaline salts, especially sodium salts, ammonium salts, amine salts, amino alcohol salts or magnesium salts) of the following compounds: alkyl sulphates,
25 alkyl ether sulphates, alkylamido ether sulphates, alkylarylpolyether sulphates, monoglyceride sulphates; alkyl sulphonates, alkyl phosphates, alkylamide

5 sulphonates, alkylaryl sulphonates, α -olefin
sulphonates, paraffin sulphonates; alkyl
sulphosuccinates, alkyl ether sulphosuccinates,
alkylamide sulphosuccinates; alkyl sulphosuccinamates;
10 alkyl sulphoacetates; alkyl ether phosphates; acyl
sarcosinates; acyl isethionates and N-acyltaurates, the
alkyl or acyl radical of all of these various compounds
preferably containing from 8 to 24 carbon atoms, and
the aryl radical preferably denoting a phenyl or benzyl
15 group. Among the anionic surfactants which can also be
used, mention may also be made of fatty acid salts such
as the salts of oleic, ricinoleic, palmitic and stearic
acids, coconut oil acid or hydrogenated coconut oil
acid; acyl lactylates in which the acyl radical
20 contains 8 to 20 carbon atoms. Weakly anionic
surfactants can also be used, such as alkyl-D-
galactosiduronic acids and their salts, as well as
polyoxyalkylenated (C_6 - C_{24}) alkyl ether carboxylic
acids, polyoxyalkylenated (C_6 - C_{24}) alkylaryl ether
25 carboxylic acids, polyoxyalkylenated (C_6 - C_{24}) alkylamido
ether carboxylic acids and their salts, in particular
those containing from 2 to 50 ethylene oxide groups,
and mixtures thereof.

Among the anionic surfactants, it is
25 preferred according to the invention to use alkyl
sulphate salts and alkyl ether sulphate salts and
mixtures thereof.

(ii) Nonionic surfactant(s):

The nonionic surfactants are, themselves also, compounds that are well known per se (see in particular in this respect "Handbook of Surfactants" by M.R. Porter, published by Blackie & Son (Glasgow and London), 1991, pp. 116-178) and, in the context of the present invention, their nature is not a critical feature. Thus, they can be chosen in particular from (non-limiting list) polyethoxylated, polypropoxylated or polyglycerolated fatty acids, alkylphenols, α -diols or alcohols having a fatty chain containing, for example, 8 to 18 carbon atoms, it being possible for the number of ethylene oxide or propylene oxide groups to range in particular from 2 to 50 and for the number of glycerol groups to range in particular from 2 to 30. Mention may also be made of copolymers of ethylene oxide and of propylene oxide, condensates of ethylene oxide and of propylene oxide with fatty alcohols; polyethoxylated fatty amides preferably having from 2 to 30 mol of ethylene oxide, polyglycerolated fatty amides containing 1 to 5, and in particular 1.5 to 4, glycerol groups; oxyethylenated fatty acid esters of sorbitan having from 2 to 30 mol of ethylene oxide; fatty acid esters of sucrose, fatty acid esters of polyethylene glycol, alkylpolyglycosides, N-alkylglucamine derivatives, amine oxides such as (C₁₀-C₁₄)alkylamine oxides or N-acylaminopropylmorpholine

oxides. It will be noted that the alkylpolyglycosides constitute nonionic surfactants that are particularly suitable in the context of the present invention.

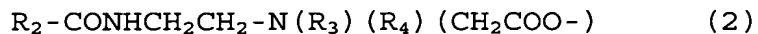
(iii) Amphoteric or zwitterionic

5 surfactant(s) :

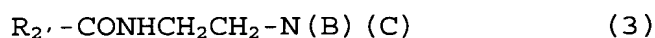
The amphoteric or zwitterionic surfactants, whose nature is not a critical feature in the context of the present invention, can be, in particular (non-limiting list), aliphatic secondary or tertiary amine
 10 derivatives in which the aliphatic radical is a linear or branched chain containing 8 to 18 carbon atoms and containing at least one water-soluble anionic group (for example carboxylate, sulphonate, sulphate, phosphate or phosphonate); mention may also be made of
 15 (C₈-C₂₀)alkylbetaines, sulphobetaines, (C₈-C₂₀)alkylamido(C₁-C₆)alkylbetaines or (C₈-C₂₀)alkylamido(C₁-C₆)alkylsulphobetaines.

Among the amine derivatives, mention may be made of the products sold under the name Miranol, as
 20 described in US patents 2 528 378 and 2 781 354 and classified in the CTFA dictionary, 3rd edition, 1982 under the names amphocarboxy glycines and amphocarboxy propionates and having the respective structures:

25



in which: R_2 denotes an alkyl radical derived from an acid R_2 -COOH present in hydrolysed coconut oil, a heptyl, nonyl or undecyl radical, R_3 denotes a β -hydroxyethyl group and R_4 denotes a carboxymethyl group;
 5 and



10 in which:

B represents $-CH_2CH_2OX'$, C represents $-(CH_2)_z-Y'$, with $z = 1$ or 2 ,

X' denotes the $-CH_2CH_2-COOH$ group or a hydrogen atom,

Y' denotes $-COOH$ or the $-CH_2-CHOH-SO_3H$ radical,

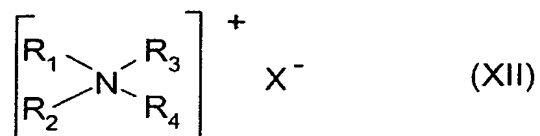
15 R_2' denotes an alkyl radical of an acid R_9 -COOH present in coconut oil or in hydrolysed linseed oil, an alkyl radical, in particular a C_7 , C_9 , C_{11} or C_{13} alkyl radical, a C_{17} alkyl radical and its iso form, an unsaturated C_{17} radical.

20 By way of example, mention may be made of the cocoamphodiacetate sold under the trade name Miranol C2M concentrated NP by the company Rhodia Chimie.

(iv) Cationic surfactants:

The cationic surfactants may be chosen from:

25 A) the quaternary ammonium salts of general formula (XII) below:



in which X^- is an anion chosen from the group of halides (chloride, bromide or iodide) or (C_2-C_6) alkyl sulphates, more particularly methyl sulphate, phosphates, alkyl or alkylaryl sulphonates, anions derived from organic acid, such as acetate or lactate, and

i) the radicals R_1 to R_3 , which may be identical or different, represent a linear or branched aliphatic radical containing from 1 to 4 carbon atoms, or an aromatic radical such as aryl or alkylaryl. The aliphatic radicals can comprise hetero atoms such as, in particular, oxygen, nitrogen, sulphur or halogens. The aliphatic radicals are chosen, for example, from alkyl, alkoxy and alkylamide radicals, R_4 denotes a linear or branched alkyl radical containing from 16 to 30 carbon atoms.

The cationic surfactant is preferably a cetyltrimethylammonium salt (for example chloride).

ii) the radicals R_1 and R_2 , which may be identical or different, represent a linear or branched aliphatic radical containing from 1 to 4 carbon atoms, or an aromatic radical such as aryl or alkylaryl. The aliphatic radicals can comprise hetero atoms such as, in particular, oxygen, nitrogen, sulphur or halogens. The aliphatic radicals are chosen, for example, from

alkyl, alkoxy, alkylamide and hydroxyalkyl radicals containing from about 1 to 4 carbon atoms;

R3 and R4, which may be identical or different, denote a linear or branched alkyl radical containing from 12
5 to 30 carbon atoms, the said radical comprising at least one ester or amide function.

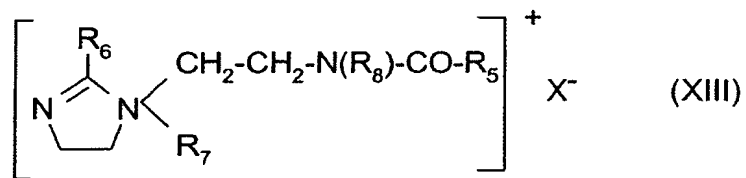
R3 and R4 are chosen in particular from

(C₁₂-C₂₂) alkylamido (C₂-C₆) alkyl and (C₁₂-C₂₂) alkylacetate radicals.

10 The cationic surfactant is preferably a stearamidopropyldimethyl(myristyl acetate) ammonium salt (for example chloride).

B) - the quaternary ammonium salts of imidazolinium, such as, for example, that of formula (XIII) below:

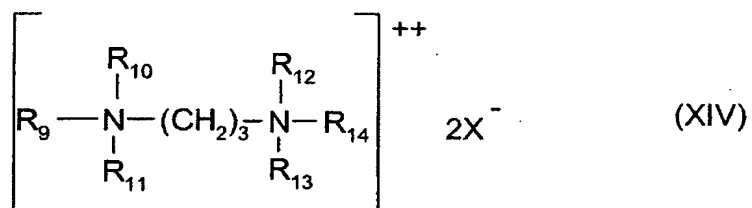
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in which R₅ represents an alkenyl or alkyl radical containing from 8 to 30 carbon atoms, for example fatty
20 acid derivatives of tallow, R₆ represents a hydrogen atom, a C₁-C₄ alkyl radical or an alkenyl or alkyl radical containing from 8 to 30 carbon atoms, R₇ represents a C₁-C₄ alkyl radical, R₈ represents a hydrogen atom or a C₁-C₄ alkyl radical, and X is an
25 anion chosen from the group of halides, phosphates, acetates, lactates, alkyl sulphates, alkyl sulphonates

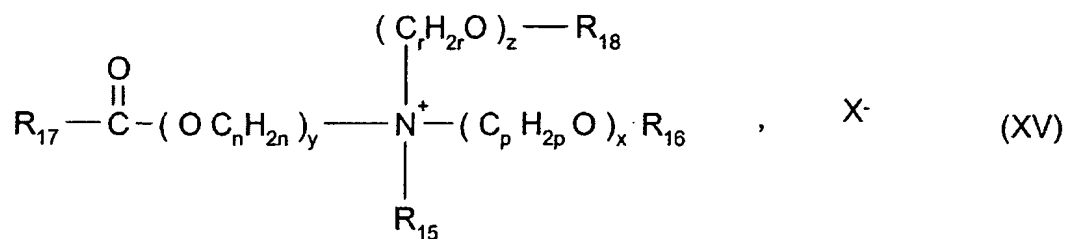
or alkylaryl sulphonates. R_5 and R_6 preferably denote a mixture of alkenyl or alkyl radicals containing from 12 to 21 carbon atoms, such as, for example, fatty acid derivatives of tallow, R_7 denotes methyl and R_8 denotes hydrogen. Such a product is, for example, Quaternium-27 (CTFA 1997) or Quaternium-83 (CTFA 1997), which are sold under the names "Rewoquat" W75, W90, W75PG and W75HPG by the company Witco,

C) - the diquaternary ammonium salts of formula (XIV):



in which R_9 denotes an aliphatic radical containing from about 16 to 30 carbon atoms, R_{10} , R_{11} , R_{12} , R_{13} and R_{14} , which may be identical or different, are chosen from hydrogen and an alkyl radical containing from 1 to 4 carbon atoms, and X is an anion chosen from the group of halides, acetates, phosphates, nitrates and methyl sulphates. Such diquaternary ammonium salts in particular comprise propanetallowdiammonium dichloride.

D) - the quaternary ammonium salts containing at least one ester function, of formula (XV) below:



in which:

- R_{15} is chosen from C_1 - C_6 alkyl radicals and C_1 - C_6 hydroxyalkyl or dihydroxyalkyl radicals;
- R_{16} is chosen from:
 - a radical $\text{R}_{19} - \overset{\text{O}}{\parallel}{\text{C}} -$
 - linear or branched, saturated or unsaturated C_1 - C_{22} hydrocarbon-based radicals R_{20} ,
 - a hydrogen atom,
- R_{18} is chosen from:
 - a radical $\text{R}_{21} - \overset{\text{O}}{\parallel}{\text{C}} -$
 - linear or branched, saturated or unsaturated C_1 - C_6 hydrocarbon-based radicals R_{22} ,
 - a hydrogen atom,
- R_{17} , R_{19} and R_{21} , which may be identical or different, are chosen from linear or branched, saturated or unsaturated C_7 - C_{21} hydrocarbon-based radicals;
- n , p and r , which may be identical or different, are integers ranging from 2 to 6;
- y is an integer ranging from 1 to 10;
- x and z , which may be identical or different, are integers ranging from 0 to 10;

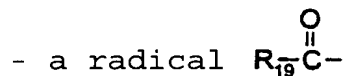
- X^- is a simple or complex, organic or inorganic anion; with the proviso that the sum $x + y + z$ is from 1 to 15, that when x is 0, then R_{16} denotes R_{20} and that when z is 0, then R_{18} denotes R_{22} .

5 Use is made more particularly of the ammonium salts of formula (XV) in which:

- R_{15} denotes a methyl or ethyl radical,
- x and y are equal to 1;
- z is equal to 0 or 1;

10 - n , p and r are equal to 2;

- R_{16} is chosen from:

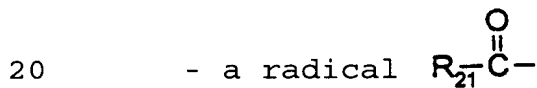


- methyl, ethyl or C_{14} - C_{22} hydrocarbon-based radicals,

15 - a hydrogen atom;

- R_{17} , R_{19} and R_{21} , which may be identical or different, are chosen from linear or branched, saturated or unsaturated C_7 - C_{21} hydrocarbon-based radicals;

- R_{18} is chosen from:



- a hydrogen atom.

Such compounds are sold, for example, under the names Dehyquat by the company Cognis, Stepanquat by the company Stepan, Noxamium by the company Ceca,
25 and Rewoquat WE 18 by the company Rewo-Witco.

Among the quaternary ammonium salts that are preferred are cetyltrimethylammonium chloride, behenyltrimethylammonium chloride or palmitamidopropyltrimethylammonium chloride sold under
5 the name Varisoft PA TC by the company Goldschmidt.

The anionic surfactants preferably used are sodium, triethanolamine or ammonium (C₁₂-C₁₄)alkyl sulphates, sodium, triethanolamine or ammonium (C₁₂-C₁₄)alkyl ether sulphates oxyethylenated with
10 2.2 mol of ethylene oxide, sodium cocoyl isethionate and sodium α -(C₁₄-C₁₆)olefin sulphonate, and mixtures thereof, with:

- either an amphoteric surfactant such as the amine derivatives known as disodium cocoamphodiacetate or
15 sodium cocoamphopropionate sold especially by the company Rhodia Chimie under the trade name "Miranol® C2M CONCNP" as an aqueous solution containing 38% active material, or under the name Miranol® C32;
- or an amphoteric surfactant such as alkylbetaines,
20 in particular the cocobetaine sold under the name "Dehyton® AB 30" as an aqueous solution containing 32% AM by the company Cognis, or such as (C₈-C₂₀)alkylamido(C₁-C₆)alkylbetaines, in particular Tegobetaine® F 50 sold by the company Goldschmidt.

25 The cosmetically acceptable medium may consist solely of water or of a mixture of water and one or more cosmetically acceptable solvents or of one

or more cosmetically acceptable solvents, such as a C₁-C₄ lower alcohol, for instance ethanol, isopropanol, tert-butanol or n-butanol; alkylene glycols, for instance propylene glycol, and glycol ethers. Water
5 preferably represents from 30% to 98% by weight and preferably from 50% to 98% by weight relative to the total weight of the composition.

Mention may be made more particularly of monoalcohols such as ethanol and isopropanol,
10 polyalcohols such as diethylene glycol and glycerol, glycol ethers, and alkyl ethers of glycol or of diethylene glycol.

The compositions according to the invention preferably have a final pH generally of between 3 and
15 10. This pH is more preferably between 4 and 8. The pH may be adjusted to the desired value in a conventional manner by adding a base (organic or mineral base) to the composition, for example aqueous ammonia or a primary, secondary or tertiary (poly)amine, for
20 instance monoethanolamine, diethanolamine, triethanolamine, isopropanolamine or 1,3-propanediamine, or alternatively by adding an acid, preferably a carboxylic acid such as, for example, citric acid.

25 The compositions in accordance with the invention may contain, in addition to the combination defined above, viscosity regulators such as

electrolytes, or thickeners (associative or nonassociative thickeners). Mention may be made in particular of sodium chloride, sodium xylenesulfonate, scleroglucans, xanthan gums, fatty acid alkanolamides, alkyl ether carboxylic acid alkanolamides optionally oxyethylenated with up to 5 mol of ethylene oxide, such as the product sold under the name "Aminol A15" by the company Chem Y, crosslinked polyacrylic acids and crosslinked acrylic acid/C₁₀-C₃₀ alkyl acrylate copolymers. These viscosity regulators are used in the compositions according to the invention in proportions that may be up to 10% by weight relative to the total weight of the composition.

The compositions in accordance with the invention may also preferably contain up to 5% of nacreous agents or opacifiers that are well known in the prior art, such as, for example, C₁₆ higher fatty alcohols, fatty-chain acyl derivatives such as ethylene glycol or polyethylene glycol monostearate or distearate, and fatty-chain ethers such as, for example, distearyl ether or 1-(hexadecyloxy)-2-octadecanol.

The compositions in accordance with the invention may also optionally contain at least one additive chosen from foam synergists such as C₁₀-C₁₈ 1,2-alkanediols or fatty alkanolamides derived from monoethanolamine or diethanolamine, silicone-based or

non-silicone-based sunscreens, anionic, nonionic, amphoteric or cationic polymers other than the polyalkyleneimines of the invention, proteins, protein hydrolysates, hydroxy acids, vitamins, provitamins such
5 as panthenol, volatile or non-volatile, linear or cyclic, crosslinked or non-crosslinked, organomodified or non-organomodified silicones, synthetic oils such as poly- α -olefins, fluoro oils, fluoro waxes, fluoro gums, carboxylic acid esters, mineral, plant or animal oils,
10 ceramides and pseudoceramides, and mixtures thereof.

Needless to say, a person skilled in the art will take care to select this or these optional additional compound(s) and/or the amounts thereof such that the advantageous properties intrinsically
15 associated with the combination in accordance with the invention are not, or are not substantially, adversely affected by the envisaged addition(s).

These additives are optionally present in the composition according to the invention for example in
20 proportions that may range from 0.00001% to 20% by weight relative to the total weight of the composition. The precise amount of each additive is readily determined by a person skilled in the art depending on its nature and its function.

25 The compositions may be in any form, including the form of fluid or thickened liquids, gels,

creams, mousses, and water-in-oil (W/O) or oil-in-water (O/W) emulsions or multiple emulsions.

They may be used, for example, as shampoos, rinse-out care products, deep-down care masks, or
5 lotions or creams for treating the scalp.

These compositions are mainly suitable for washing and caring for keratin materials, in particular the hair and the skin, and even more particularly the hair.

10 The compositions of the invention may more particularly be in the form of shampoos, rinse-out or leave-in conditioners, permanent-waving, relaxing, dyeing or bleaching compositions, or alternatively in the form of compositions to be applied before or after
15 dyeing, bleaching, permanent-waving or relaxing the hair or even between the two steps of a permanent-waving or hair-relaxing operation. The compositions are preferably washing and foaming compositions for the skin and/or the hair.

20 In particular, the compositions according to the invention are foaming detergent compositions such as shampoos, shower gels and bubble baths. In this embodiment of the invention, the compositions comprise at least one detergent surfactant.

25 The detergent surfactant(s) may be chosen without preference, alone or as mixtures, from the

anionic, amphoteric, nonionic, zwitterionic and cationic surfactants described above.

The minimum amount of surfactant is the amount that is just sufficient to give the final
5 composition satisfactory foaming power and/or detergent power.

Thus, according to the invention, the detergent surfactant may represent for example from 3% to 30% by weight, preferably from 6% to 25% by weight
10 and even more preferably from 8% to 20% by weight relative to the total weight of the final composition.

When the compositions in accordance with the invention are used as standard shampoos, they are simply applied to wet hair and the lather generated by
15 massaging or rubbing with the hands is then removed, after an optional action time, by rinsing with water, the operation possibly being repeated one or more times.

A subject of the invention is also a process
20 for washing and conditioning keratin materials, especially such as the hair, which consists in applying a composition as defined above and then in rinsing with water, after an optional action time.

The compositions according to the invention
25 are preferably used as shampoos for washing and conditioning the hair, and they are applied in this case to damp hair in amounts that are efficient to wash

the hair, this application being followed by rinsing with water.

The compositions in accordance with the invention may also be used as shower gels for washing
 5 and conditioning the hair and/or the skin, in which case they are applied to the damp skin and/or hair and are rinsed out after application.

The compositions of the invention may also be used in leave-in mode, and in particular in lotions, in
 10 gels, in mousses or in aerosols.

According to the invention, a premix of the particles and of the polyalkyleneimine is prepared and is introduced into the composition comprising the surfactants.

15 Concrete, but in no way limiting, examples illustrating the invention will now be given.

EXAMPLE 1:

The shampoo composition below was prepared:

Triethanolamine lauryl sulphate as an aqueous solution containing 40% AM.....	31.2 g
(C1/C9) alkyl polyglucoside [1,4] as an aqueous 40% solution.....	6.25 g
Polyethyleneimine (Lupasol FG from BASF)...	0.015 g
Powdered calcium carbonate (Omyapur 35 sold by Omya)	3 g
pH agent qs	pH=7
Water qs	100 g

The composition has a pleasant texture when applied to damp hair. It rinses out well. The wet hair is not laden and is easy to shape.

EXAMPLE 2:

5 The shampoo composition below was prepared:

Sodium laurylether sulphate as an aqueous solution containing 30% AM.....	17.8 g
Cocoylamidopropyl betaine as an aqueous solution containing 30% AM.....	8.3 g
Polyethyleneimine (Lupasol FG from BASF)...	0.015 g
Powdered laponite (Laponite XLG from Laporte)	3 g
pH agent qs	pH=7
Water qs	100 g

The composition has a pleasant texture when applied to damp hair. It rinses out well. The wet hair is not laden and is easy to shape.

EXAMPLE 3:

10 The lotion below was prepared:

Polyethyleneimine (Lupasol FG from BASF).....	0.015 g
Powdered calcium carbonate (Omyapur 35 sold by Omya)	3 g
pH agent qs	pH=7
Water qs	100 g

The frictional forces were measured on locks of natural dried hair using a sliding bench.

A mobile lock, attached to a sliding bench, is entrained in a horizontal rectilinear motion between two other fixed locks. The force to be exerted to make the lock slide is measured using an electronic gauge
 5 connected to the drive arm. The greater the sliding force, the greater the effects of the deposit of the particles. The styling effect is reinforced.

The results are collated in the table below:

	Example 3 with calcium carbonate	Comparative (PEI free)
Frictional forces	30.8 g	25.2 g

10

The sliding force for the composition containing calcium carbonate and polyethyleneimine (PEI) according to the invention is markedly higher than that for the PEI-free composition.

15

EXAMPLE 4

The lotion below was prepared:

Polyethyleneimine (Lupasol FG from BASF)	0.015 g
Powdered laponite (sodium lithium magnesium silicate) (Laponite XLG from Laporte)	3 g
pH agent qs	pH=7
Water qs	100 g

The frictional forces were measured on locks of natural dried hair using a sliding bench.

A mobile lock, attached to a sliding bench, is entrained in a horizontal rectilinear motion between two other fixed locks. The force to be exerted to make the lock slide is measured using an electronic gauge
5 connected to the drive arm. The greater the sliding force, the greater the effects of the deposit of the particles. The styling effect is reinforced.

The results are collated in the table below:

	Example 4 with Laponite	Comparative (PEI free)
Frictional forces	25.7 g	19.3 g

10

The sliding force for the composition containing laponite and polyethyleneimine (PEI) according to the invention is markedly higher than that for the PEI-free composition.

15 The above written description of the invention provides a manner and process of making and using it such that any person skilled in this art is enabled to make and use the same, this enablement being provided in particular for the subject matter of the
20 appended claims, which make up a part of the original description.

As used above, the phrases "chosen from," "selected from the group consisting of," and the like include mixtures of the specified materials.

All references, patents, applications, tests, standards, documents, publications, brochures, texts, articles, etc. mentioned herein are incorporated herein by reference. Where a numerical limit or range is
5 stated, all values and subranges therewithin are specifically included as if explicitly written out.

The above description is presented to enable a person skilled in the art to make and use the invention, and is provided in the context of a
10 particular application and its requirements. Various modifications to the preferred embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments and applications without departing
15 from the spirit and scope of the invention. Thus, this invention is not intended to be limited to the embodiments shown, but is to be accorded the widest scope consistent with the principles and features disclosed herein.